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PATENT APPLICATION

IN THE U.S. PATENT AND TRADEMARK OFFICE

April 6, 2007

Applicants: Yoshihiko GOTOH et al

For: METHOD FOR MANUFACTURING QUARTZ GLASS INGOT AND A MANUFACTURING APPARATUS

Serial No.: 09/863 750 Group: 1731

Confirmation No.: 9121

Filed: May 23, 2001 Examiner: Lopez

Atty. Docket No.: Ishii 17

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF

Sir:

Enclosed herewith is a Supplemental Appeal Brief in which the "STATUS OF CLAIMS" has been added. Favorable consideration is respectfully solicited.

Respectfully submitted,

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Encl: Supplemental Appellants' Brief on Appeal
Claims Appendix
Evidence Appendix
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Postal Card

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, DC 20231 on April 6, 2007.

Terryence F. Chapman

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SUPPLEMENTAL APPELLANTS' BRIEF ON APPEAL

Sir:

Appellants' respectfully appeal the decision of the Examiner dated October 3, 2006 finally rejecting Claims 20-27.

REAL PARTY IN INTEREST

Tosoh Quartz Corporation is the Assignee of the present application and the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences to the present application.

STATUS OF CLAIMS

Claims 1-19 have been canceled. Claims 20-27 are pending and the claims for review on appeal.

STATUS OF AMENDMENTS

There have been no amendments filed subsequent to the final rejection dated October 3, 2006.

SUMMARY OF CLAIMED SUBJECT MATTER

Appellants' invention, as defined by independent Claim 20, is directed to a method of manufacturing a quartz glass slab ingot which comprises the steps of providing a rotatable furnace having a feeder at a top portion thereof and a burner (Figure 1; page 14 of the clean copy of the substitute specification, lines 26-33, and page 15 of the clean copy of the specification, lines 1 and 2), feeding silica powder to the rotatable furnace such that the silica powder drops around the center of a furnace bed in the rotatable furnace through the feeder (Figure 1), fusing the silica powder in the rotatable furnace (page 7 of the clean copy of the specification, lines 32 and 33), depositing the fused silica at the center of the furnace bed (page 6 of the clean copy of the specification, lines 24 and 25) and extending the fused silica deposit outwardly from the center of the furnace bed by heating and rotating the furnace (page 6 of the clean copy of the specification, lines 26-28, and page 18 of the clean copy of the specification, lines 23-25), wherein the gas supplied to the burner has a hydrogen/oxygen gas ratio of from 2.1 to 2.5 (page 27 of the clean copy of the specification, lines 10-12).

Claim 21 limits Claim 20 in additionally comprising the step of depositing zirconia particles having a diameter of 2 to 10 nm on the surface of the furnace bed prior to dropping the silica powder onto the furnace bed (page 16 of the clean copy of the specification, lines 8-11).

Claim 22 limits Claim 20 in requiring that raw material be fed to the furnace at a rate of from 1.0 to 10 kg/hr (page 20 of the clean copy of the specification, lines 10 and 11).

Claim 23 limits Claim 20 in requiring that the ingot have the shape of a column (page 27 of the clean copy of the specification, lines 13-20).

Claim 24 limits Claim 20 in requiring that the ingot have the shape of a solid round bar (page 11 of the clean copy of the specification, lines 5-7, 29 and 30).

Claim 25 limits Claim 20 in requiring that the ingot have the shape of a plate (page 11 of the clean copy of the specification, lines 29 and 30).

Claim 26 limits Claim 20 in requiring that the silica powder drop solely around the center of the furnace bed (Figure 1).

Claim 27 limits Claim 20 in requiring that the burner comprises a hydrogen supply tube, an oxygen supply tube and a silica powder supply tube (page 12 of the clean copy of the specification, lines 1-3).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellants respectfully request review of the rejection of Claims 20-27 under 35 USC 103(a) as being unpatentable over Sayce et al '682 or over Sayce et al '955 and further in view of Komine et al.

ARGUMENT

REJECTION OF CLAIMS 20-26 UNDER 35 USC 103(a) AS BEING UNPATENTABLE OVER SAYCE ET AL IN VIEW OF KOMINE ET AL

Independent Claim 20 is directed to a method of manufacturing a quartz glass slab ingot which comprises the steps of providing a rotatable furnace having a feeder at a top portion thereof and a burner, feeding silica powder to the rotatable furnace such that the silica powder drops around the center of a furnace bed in the rotatable furnace through the feeder, fusing the silica powder in the rotatable furnace, depositing the fused silica at the center of the furnace bed and extending the fused silica deposit outwardly from the center of the furnace bed by heating and rotating the furnace. The gas supplied to the burner has a hydrogen/oxygen gas ratio of from 2.1 to 2.5.

The present invention allows for the manufacture of a quartz slab ingot which can be produced in the form of a column, a solid round bar or a plate. An oxygen-hydrogen

flame method is used to manufacture quartz glass in the claimed shape which contains about 200 parts per million of hydroxide contaminant.

Prior art methods feed silica to the furnace through several distributing channels with a carrier gas which makes it possible to supply a large amount of silica into the furnace and enlarge the scale of the product quartz glass ingot. The present inventors discovered that the large flow of silica powder tends to interfere with the flow of hydrogen gas and, if the diameter of the quartz glass ingot exceeds 400 mm, the supply rate of silica powder makes the hydrogen gas flow turbulent and prevents the uniform dispersion of the silica powder in the oxygen-hydrogen gas mixture. This results in the silica powder not being uniformly fused and the generation of bubbles inside the fused quartz glass, which impairs the quality of the quartz glass. In the present invention, a large quartz glass ingot can be produced directly through the fusion of silica powder without the necessity of fusing a column ingot with secondary heating.

The Sayce et al references disclose a method and apparatus for the manufacture of synthetic vitreous silica ingots by forming a melt of synthetic vitreous silica in a crucible within a refractory furnace and continuously withdrawing an ingot through an orifice in the wall of the furnace. This reference discloses in the last paragraph in column 2 that the silica within a container can be kept above sintering temperature by one or more burners, which may conveniently be supported by the roof of the furnace enclosure and, preferably, the synthetic silica is produced by vapor deposition such that at least one of the burners should be a synthesis burner. The first three lines in column 3 of this reference also states that alternatively, pre-synthesized silica may be supplied to the crucible in the form of powder, crystal or amorphous grains. Column 4, lines 25-30, further reiterate this fact as it states that synthetic vitreous silica may be supplied directly to the crucible in the form of

powder, crystal or amorphous grains rather than being deposited there by a synthesis burner.

The Sayce et al references have no disclosure with respect to feeding silica powder through a feeder provided at a top portion of the furnace such that the silica powder drops around the center of a furnace bed in the rotatable furnace through the feeder. The Sayce et al references only disclose precursor silica organic compounds, in the form of a gas or vapor, being introduced into the furnace at a top portion thereof through a synthesis burner to generate synthetic silica inside the furnace. Additionally, this reference specifically shows three burners being used in the inventive apparatus and no specific burner is indicated as being the synthesis burner. Therefore, this reference does not have any disclosure with respect to feeding the synthetic silica to the center of the furnace bed.

In the final rejection, the Examiner states "The claimed dropping of silica powder around the center of the furnace bed is deemed as the powder dropping from the silica powder synthesis burners 53 onto the furnace bed formed by crucible 55." "The claimed deposition of the fused silica at the center of the furnace bed is deemed as the silica being deposited by central burner 53 on the center of the furnace as shown in figure 4." However, currently presented Claim 20 requires that silica powder is fed to the rotatable furnace and not generated therein. Moreover, as pointed out above, there is no disclosure in the Sayce et al references which suggests that the synthetic silica powder is synthesized only from the central burner and that the synthesized silica powder only drops around the center of the furnace bed. Appellants respectfully submit that the Examiner is extracting more out of the Sayce et al references than is actually disclosed there with the benefit of hindsight provided by Applicants' disclosure. The Sayce et al references exclude the used silica from being made by the fusion of refined natural quartz crystal powders and, in this reference, a synthetic quartz

glass ingot is withdrawn from the orifice downwardly to set the dimensions of the ingot by the configuration of the orifice. In contrast thereto, in the present invention, the silica powder is dropped around the center of a rotatable furnace bed and the fused silica powder extended horizontally by centrifugal force produced by rotating the furnace such that the dimensions of the silica ingot is defined by the cross-section of the furnace. Therefore, the secondary reference cited by the Examiner must provide the motivation to one of ordinary skill in the art to modify the Sayce et al references in a manner that would yield the presently claimed invention. It is respectfully submitted that the secondary Komine et al reference has no such disclosure.

Komine et al discloses an optical member made of silica glass and manufactured by the direct method wherein a material gas containing an organo-silicon compound is allowed to react in an oxidizing flame. In this reference, an organo-silicon compound and an inactive gas are ejected from a tube placed in the center of the burner and an oxygen gas and a hydrogen gas are ejected from a tube placed in the center of the burner and an oxygen gas and a hydrogen gas are ejected from a tube arranged around the tube placed in the center so that silica glass fine particles are produced by the reaction of the organo-silicon compound in an oxidizing flame. The silica glass fine particles deposit on the target 5 rotating and rocking and at the same time are melted and vitrified to obtain an ingot of transparent silica glass.

Komine et al has been cited by the Examiner as suggesting the use of an oxygen to hydrogen gas supply of 0.48 or more. However, since this reference is only concerned with a vapor phase reaction to produce a silica powder from an organo-silicon compound while the presently claimed invention requires that silica powder be directly fed into the furnace, it is respectfully submitted that this teaching can only be properly combinable with the primary Sayce et al references when organo-silicon compounds in the form of a gas or a vapor

is introduced into the furnace. The oxygen-hydrogen ratio recited in Komine et al is concerned with the burning of the organo-silicon vapor or gas compound. In contrast thereto, the present invention has no such concern since silica powders are fed into the furnace through the top thereof and, as such, Komine et al in combination with the Sayce et al reference does not disclose the invention claimed in Claims 20-26.

REJECTION OF CLAIM 27 UNDER 35 USC 103(a)
AS BEING UNPATENTABLE OVER THE SAYCE ET AL REFERENCES
IN COMBINATION WITH KOMINE ET AL

Claim 27 is patentably distinguishable over the cited references for the reasons advanced above and additionally because Claim 27 requires that the burner be made up of a hydrogen supply tube, an oxygen supply tube and a silica powder supply tube. That is, Claim 27 requires that silica powder be supplied to the furnace through the burner. It would be readily apparent to one of ordinary skill in the art that there are different engineering considerations in feeding gaseous organo-silicon compounds to the furnace through the burners and feeding silica powder to the furnace through the burners. In the references cited by the Examiner, only vapors and/or gases are fed into the furnace through the burners. Since Claim 27 specifically requires that the burner comprise a silica powder supply tube, it is respectfully submitted that this claim is even further patentably distinguishable over the prior art cited by the Examiner.

CONCLUSION

For the reasons advanced above, it is respectfully submitted that the references cited by the Examiner do not even present a showing of prima facie obviousness under 35 USC 103(a) over the presently claimed invention. The presently claimed invention provides a method of manufacturing quartz glass in a desired shape which contains only about 200 parts per million of hydroxide. The prior art references are

primarily concerned with the formation of silica powder inside the furnace after a gas phase reaction has been conducted. If synthetic vitreous silica is used as the precursor material, it is supplied directly to the crucible in the furnace in the form of a powder, crystal or amorphous grain rather than being deposited there by a synthesis furnace. As such, the references cited by the Examiner clearly do not disclose the claimed method. Reversal of the Examiner is respectfully solicited.

Respectfully submitted,

Terryence F. Chapman

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Encl: Claims Appendix
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CLAIMS APPENDIX

20. A method of manufacturing a quartz glass slab ingot comprising the steps of:

providing a rotatable furnace having a feeder at a top portion thereof and a burner;

feeding silica powder to the rotatable furnace such that the silica powder drops around the center of a furnace bed in the rotatable furnace through the feeder;

fusing the silica powder in the rotatable furnace;

depositing the fused silica at the center of the furnace bed; and

extending the fused silica deposit outwardly from the center of the furnace bed by heating and rotating the furnace, wherein gas supplied to the burner has a hydrogen/oxygen gas ratio of from 2.1 to 2.5.

21. The method of Claim 20, additionally comprising the step of depositing zirconia particles having a diameter of 2 to 10 nm on the surface of the furnace bed prior to dropping the silica powder onto the furnace bed.

22. The method of Claim 20, wherein raw material is fed to the furnace at a rate of from 1.0 to 10 kg/hr.

23. The method of Claim 20, wherein said ingot has the shape of a column.

24. The method of Claim 20, wherein said ingot has the shape of a solid round bar.

25. The method of Claim 20, wherein said ingot has the shape of a plate.

26. The method of Claim 20, wherein the silica powder drops solely around the center of the furnace bed.

27. The method of Claim 20, wherein the burner comprises a hydrogen supply tube, an oxygen supply tube and a silica powder supply tube.

EVIDENCE APPENDIX

There is no evidence being relied on by Appellant in the appeal.

RELATED PROCEEDINGS APPENDIX

There are no related proceedings.